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Topographic and Geologic Survey of Pennsylvania

RICHARD R. HICE, State Geologist

Oil and Gas Map

OF

Southwestern Pennsylvania

1915

HARRISBURG, PA.:
WM. STANLEY RAY, STATE PRINTER
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TABLE OF CONTENTS.

Page.
Introductory, ... 7
Petroleum, ... 8
  Production by counties, ... 9
  Wells, ... 12
  Acreage, ... 14
Natural Gas, ... 16
  Production of, ... 16
  Consumption of, ... 18
Oil and Gas Pools, ... 20

OIL AND GAS MAP OF SOUTHWESTERN PENNSYLVANIA.

INTRODUCTORY.

The accompanying map of southwestern Pennsylvania is intended to show in a general way the various oil and gas pools of that area. It also shows the structure, by contours on the horizon of the Pittsburgh coal bed, so far as the same has been determined, from which the relation of the several pools to geologic structure can be seen.

It is realized that a map of this character is far from perfect, especially in the absence of active field work in the areas covered, but the constant demand for an oil and gas map, and the many years which have elapsed since the issue of the maps of the Second Geological Survey (which maps have long been out of print and are not available) coupled with the issue at this time of a general geologic map of this area, seem to make the present an opportune time for this publication.

It is also believed that a summary of some of the more pronounced features concerning the output of petroleum and natural gas in Pennsylvania will be of value in this connection.

In publishing the structure on the horizon of the Pittsburgh coal it is, of course, realized that it does not accurately represent the structure at the horizon of producing sands, but on the other hand it is impossible to secure that detail of information over much of the area which would enable the portrayal of structure on any one of the oil and gas horizons. Not only so, but the want of continuity of the oil and gas horizons over much of the area, and the absence of some of them in almost every portion of the area, would render such a map impossible. It is believed, however, that the structure as depicted on this horizon is sufficiently accurate to show the general relation of the pools to structure in a way not heretofore illustrated from this State.

The following table shows the value of the production of petroleum and natural gas, together with the combined value, for the years 1900-1913, from which it will be seen there has been a marked increase in the combined value, notwithstanding a general decrease in the value of the petroleum output. In 1913 the total value of the mineral production of Pennsylvania was in excess of $500,000,000, and of this total the value of the petroleum and natural gas output, $41,501,297, represents one-twelfth of the whole.

VALUE OF COMBINED PRODUCTION OF PETROLEUM AND NATURAL GAS IN PENNSYLVANIA. 1900-1913.

Year.	Petroleum.	Natural Gas.	Total.
1900,	$18,088,016	$10,215,412	$28,303,428
1901,	15,430,609	12,688,161	28,118,770
1902,	15,266,093	14,352,183	29,618,276
1903,	18,170,881	16,182,834	34,353,715
1904,	18,222,242	18,139,914	36,362,156
1905,	14,653,278	19,197,336	33,850,614
1906,	16,596,943	18,558,245	35,155,188
1907,	17,579,706	18,844,156	36,423,862
1908,	16,881,194	19,104,944	35,986,138
1909,	15,424,554	20,475,207	35,899,761
1910,	11,908,914	21,057,211	32,966,125
1911,	10,894,074	18,520,796	29,414,870
1912,	12,886,752	18,539,672	31,426,424
1913,	19,805,452	21,695,845	41,501,297

PETROLEUM.

The following table, and the diagram, shows the production of petroleum in Pennsylvania, in barrels of 42 gallons, for each year from 1900 to 1913, together with the years 1861, 1871, 1881 and 1891. In this table the production for the years 1861, 1871 and 1881, is the combined output of Pennsylvania and New York. The production for 1891, and the following years, is that of Pennsylvania alone.

The first recorded production of petroleum in the United States was 2,000 barrels in 1859. This production rapidly increased, as is illustrated by the table, to a maximum, in the State of Pennsylvania, of 31,424,206 barrels in the year 1891. From the year 1891 there has been a decrease of output in Pennsylvania almost every year, the years of increase being 1895, 1896, 1900 and 1913. During the period of 1900 to 1913 there was a continuing decrease from 13,258,202 barrels, to 7,837,948 barrels in the year 1912. Owing to the great increase in price this continuing decline was changed to a slight increase in the year 1913, when 7,963,282 barrels were produced, being 1.6 per cent. over the preceding year.

The value of the oil produced is given in the table for the years 1900 to 1913, and shown graphically on the diagram.

Figures are not available showing the number of productive wells in the State prior to the year 1908. In 1908 there were 49,043 wells, which number has gradually increased to 55,077 wells December 31, 1913. This is an increase of more than 12 per cent. in a period of five years, and notwithstanding this increase in the number of wells there was a decrease in the same period of about 1,500,000 barrels in

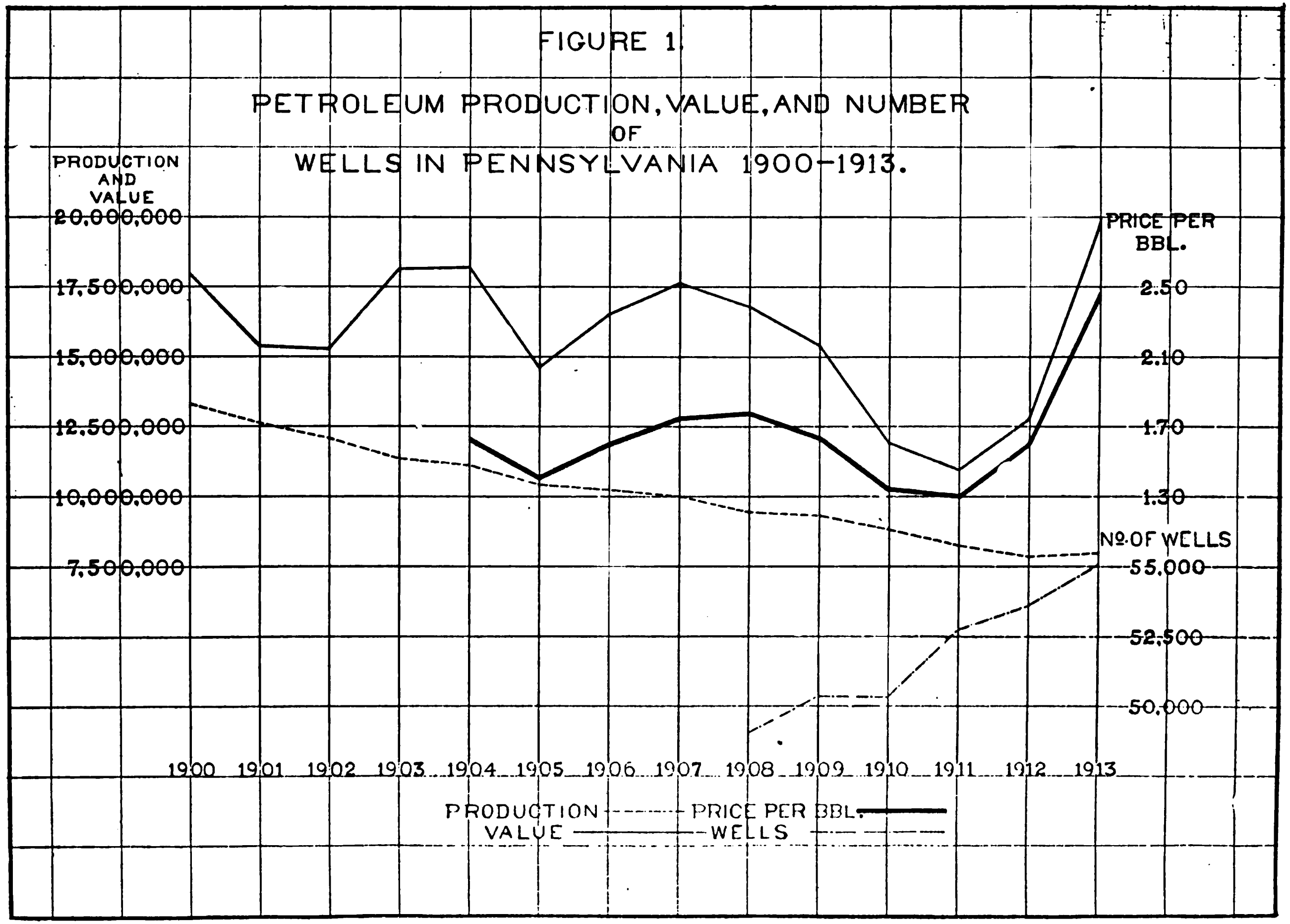

FIGURE 1.

PETROLEUM PRODUCTION, VALUE, AND NUMBER OF WELLS IN PENNSYLVANIA 1900–1913.

production. It is not believed that the number of wells reported includes the entire number operated in the State. Another feature to be noted is the decline in the number of acres owned by operators and held under lease, as is indicated by the figures for the years 1909, 1910 and 1913.

It will be noted from the table there was considerable fluctuation in the price of petroleum during the period covered. The average price ranged from $1.30 per barrel in 1911 to $2.463 per barrel in 1913. This latter figure is the highest price per barrel during the period covered by the table of values, and accounts for the great increase in total value in 1913 as compared with the preceding year.

PRODUCTION OF PETROLEUM IN PENNSYLVANIA, 1861 TO 1913.

Year.	Production.	Value.	Productive Wells.	Acreage.
1861,	a 2,113,609	....	....	....
1871,	a 5,205,234	....	....	....
1881,	a27,376,509	....	....	....
1891,	31,424,206	....	....	....
1900,	13,258,202	$18,088,016	....	....
1901,	12,625,378	15,430,609	....	....
1902,	12,063,880	15,266,093	....	....
1903,	11,355,156	18,170,881	....	....
1904,	11,125,762	18,222,242	....	....
1905,	10,437,195	14,653,278	....	....
1906,	10,256,893	16,596,943	....	....
1907,	9,999,306	17,579,706	....	....
1908,	9,424,325	16,881,194	49,043	....
1909,	9,299,403	15,424,554	50,310	1,492,793
1910,	8,794,662	11,908,914	50,288	1,026,934
1911,	8,248,158	10,894,074	52,745	*
1912,	7,837,948	12,886,752	53,545	*
1913,	7,963,282	19,805,452	55,077	1,082,933

*Data not complete.
aIncludes New York.

PRODUCTION BY COUNTIES.

In presenting the table of production of petroleum by counties it must be said at the outset that the figures are not entirely accurate, yet it is believed that the table showing the production for the years 1909, 1911, 1912 and 1913 will be of very considerable value. The accuracy of the compiled figures is rapidly increasing each year.

Comparing the county production of 1912 and 1913 it is to be noted the increase was from the counties of Forest, Lawrence, McKean, Potter, Venango, Warren and Washington, and that the production of only Lawrence, Venango and Washington, in 1913, exceeded that of the year 1911. Particular note is to be made of the increased production in Lawrence County, amounting to almost 150,000 barrels in 1913 as compared with 1912. This was due to the Bessemer oil pool, in the southwestern portion of Lawrence County, adjoining the Ohio state line, where a shallow territory was developed in the Berea sand and almost 1,000 wells have been drilled. If it had not been for this increased output in Lawrence County there would have been a decline in the total production of 1913 as in the preceding years, notwithstanding the increased output in some of the other counties, caused by the high price of oil.

PRODUCTION OF PETROLEUM BY COUNTIES, 1909 TO 1913. IN BARRELS.

County.	Production 1909.	Production 1910.*	Production 1911.	Production 1912.	Production 1913.
Allegheny,	770,264		1,014,275	861,652	850,028
Armstrong,	52,004		43,445	36,107	35,280
Beaver,	125,089		113,670	114,526	104,283
Butler,	1,697,022		1,229,738	1,210,330	1,118,265
Clarion,	395,573		296,646	290,389	220,685
Crawford,	58,704		50,356	41,398	34,866
Elk,	207,415		167,722	158,297	146,843
Forest,	225,574		203,185	184,169	186,505
Greene,	297,060		299,988	281,868	275,388
Jefferson,	57,314		45,461	36,616	32,212
Lawrence,	7,308		22,211	33,591	181,815
McKean,	1,678,358		1,629,927	1,501,773	1,535,015
Mercer,	102,873		50,693	42,866	31,073
Potter,	36,288		23,866	15,076	23,743
Tioga,	6,189		2,011	1,200	1,200
Venango,	1,657,560		1,360,102	1,300,534	1,366,883
Warren,	572,396		456,361	421,024	426,216
Washington,	758,398		492,321	505,175	531,647

*Data not complete.

The accompanying table of wells, showing the number in each county for the years 1909 to 1913, should be of value. The great stimulation of production in 1913 was shown in the great increase in the number of wells drilled. This increase was in the counties of Allegheny, Butler, Elk, Forest, Lawrence, McKean, Potter, Venango and Washington. The greatest increase was in the counties of Lawrence, with 301 wells, and in Venango with 888 wells. There was very little change in the number of wells operated in the other counties.

NUMBER OF PRODUCING OIL WELLS BY COUNTIES—1909 TO 1913.

County.	1909.	1910.	1911.	1912.	1913.
Allegheny,	1,728	1,743	1,688	1,664	1,680
Armstrong,	171	178	179	170	168
Beaver,	629	613	593	609	590
Butler,	5,493	5,351	5,116	5,268	5,469
Clarion,	1,598	1,595	1,792	1,749	1,751
Crawford,	500	507	616	597	568
Elk,	1,063	1,078	1,116	1,118	1,150
Forest,	1,512	1,501	1,663	1,612	1,662
Greene,	433	428	484	496	507
Jefferson,	125	126	131	135	142
Lawrence,	9	22	68	617	918
McKean,	14,571	14,609	15,055	14,970	15,055
Mercer,	267	271	266	276	275
Potter,	159	149	85	78	92
Tioga,	45	41	26	7	7
Venango,	13,877	13,989	15,199	15,552	16,440
Warren,	6,308	6,312	6,906	6,899	6,941
Washington,	1,822	1,765	1,792	1,728	1,662

The accompanying table of the area owned in fee, or held under lease for petroleum purposes, in each of the several producing counties of the State for the years 1909-1913 will be of interest. It is to be regretted that similar data is not available for earlier years.

AREA OWNED IN FEE OR HELD UNDER LEASE FOR PETROLEUM—1909 TO 1913.

County.	1909.	1910.	1911.*	1912.	1913.
Allegheny,	198,560	41,895	....	50,165	71,734
Armstrong,	4,449	3,375	....	3,153	5,585
Beaver,	25,567	25,328	....	13,186	14,880
Butler,	93,690	106,114	....	63,108	80,855
Clarion,	52,565	59,498	....	28,460	33,182
Crawford,	4,104	3,897	....	4,150	5,892
Elk,	90,322	103,352	....	66,460	67,602
Forest,	78,293	65,062	....	65,575	77,852
Greene,	160,304	69,656	....	83,461	79,821
Jefferson,	44,406	45,461	....	36,614	42,257
Lawrence,	2,570	2,200	....	5,025	15,567
McKean,	203,521	178,127	....	169,260	211,869
Mercer,	3,578	3,131	....	1,981	3,225
Potter,	56,841	15,315	....	*	45,198
Tioga,	685	635	....	222	247
Venango,	211,874	131,036	....	*	115,119
Warren,	88,340	64,936	....	73,427	78,396
Washington,	173,124	104,150	....	*	133,652

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*Data not complete.

NATURAL GAS.

PRODUCTION.

The following table and diagram shows the value of the production of natural gas in Pennsylvania from the year 1882 to 1913. The smallest production in this table is the year 1882, when the value of the output was approximately $75,000. The value of this output rose rapidly to the year 1888, when it reached a maximum of $19,282,375, from which it declined quite regularly to the year 1896, at which time the production had declined to a value of $5,528,610.

From the year 1897 the data regarding the natural gas business in the State is more full than in the earlier years, and from 1906 it is quite complete. The number of producers in the State in 1897 was 176, which has increased quite gradually to 1,174 in 1913.

From the minimum production of five and a half million dollars in 1896, there has been a gradual increase, with but slight exceptions, each year to 1913, when the value of the total production in Pennsylvania reached $21,695,845, for the first time exceeding the value of the year 1888.

An examination of the tables and of the diagram will show how this increase has been maintained. In the year 1897 there were 2,467 gas wells in the State, which number had increased five fold in 1913, to 12,255 wells. In the year 1906, 1,647,693 acres were owned or held under lease for natural gas purposes, which area increased in 1913 to 2,211,440 acres. This increase in the number of acres owned or controlled by the various producers of natural gas means a very great increase in operating cost, and, if we had available the details showing the number of wells that have been drilled in each of the several counties, we would find that those drilled have on an average been at an increasing distance from the centres of consumption, which necessarily means a great increase in investments in pipe lines, in addition to the very heavy cost of drilling. When we take into consideration the necessary increase in the cost of operating, due to the increased holding of territory, to the drilling of a great number of additional wells, and the expense attending the reaching of them and carrying of the output to points of consumption, the increase in the average price per thousand cubic feet from 13.4 cents in 1906 to 18.25 cents in 1913, cannot be considered excessive.

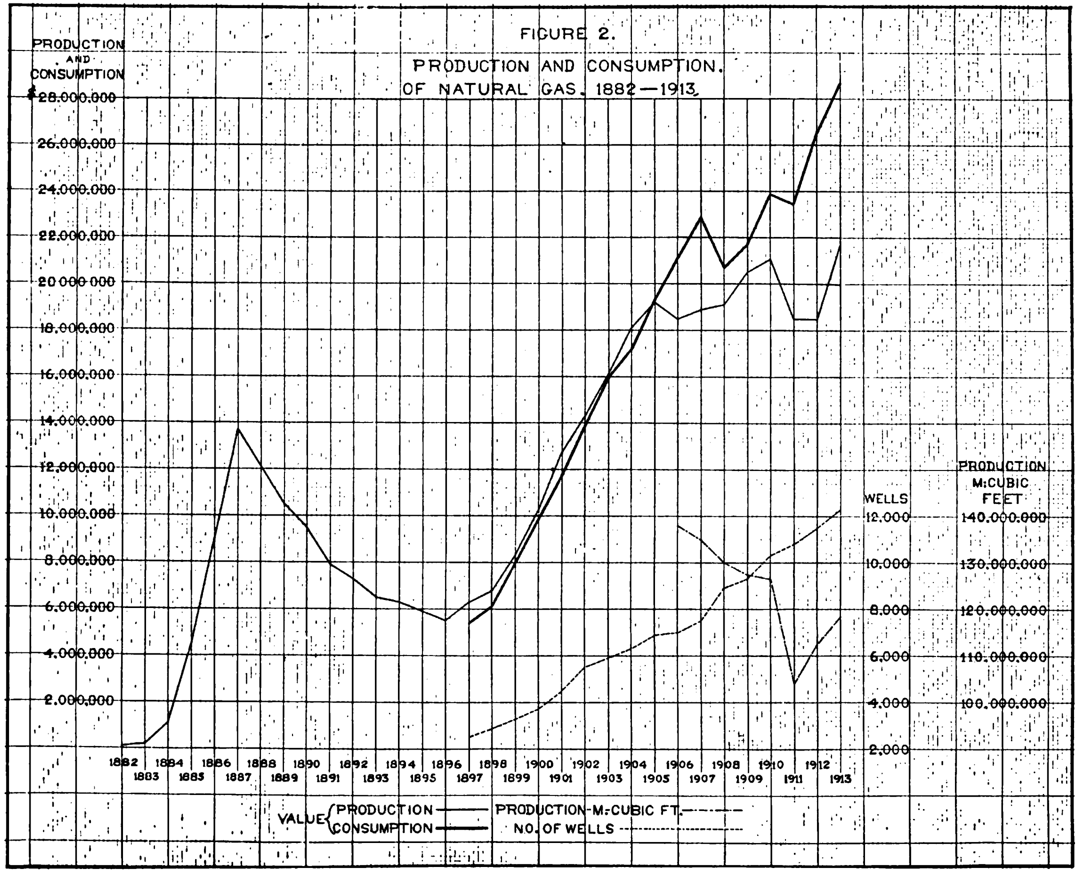

FIGURE 2.

PRODUCTION AND CONSUMPTION. OF NATURAL GAS, 1882—1913.

PRODUCTION OF NATURAL GAS IN PENNSYLVANIA. 1882-1913.

Year.	Number of Producers.	Production.			Number of Wells. Dec. 31.	Area Controlled in Acres.
		Production (M cubic feet.)	Cents per M cubic feet.	Value.		
1882,				$ 75,000		
1883,				200,000		
1884,				1,100,000		
1885,				4,500,000		
1886,				9,000,000		
1887,				13,749,500		
1888,				19,282,375		
1889,				11,593,989		
1890,				9,551,025		
1891,				7,834,016		
1892,				7,376,281		
1893,				6,488,000		
1894,				6,279,000		
1895,				5,852,000		
1896,				5,528,610		
1897,	176			6,242,543	2,467	
1898,	232			6,806,742	2,840	
1899,	281			8,337,210	3,303	
1900,	266			10,215,412	3,776	
1901,	296			12,688,161	4,529	
1902,	379			14,352,183	5,444	
1903,	414			16,182,834	5,915	
1904,	414			18,139,914	6,352	
1905,	351			19,197,336	6,855	
1906,	309	138,161,385	13.4	18,558,245	7,000	1,647,693
1907,	344	135,516,015	13.9	18,844,156	7,521	1,754,262
1908,	572	130,476,237	14.64	19,104,944	8,831	1,858,884
1909,	777	127,697,104	16.03	20,475,207	9,313	1,846,076
1910,	819	126,866,729	16.60	21,057,211	10,337	1,949,733
1911,	1,067	104,018,296	17.32	18,520,796	10,809	2,032,772
1912,	1,104	112,149,855	16.53	18,539,672	11,543	2,187,388
1913,	1,174	118,860,269	18.25	21,695,845	12,255	2,211,440

CONSUMPTION.

The table showing the consumption of natural gas in Pennsylvania from the year 1906 to 1913 is quite complete, and, taken in connection with the diagram, clearly shows the consumption in the State as compared with the production.

The number of domestic consumers has risen from 185,678 in 1902 to 400,823 in 1913, while in the same period the number of industrial consumers has increased from 2,448 to 4,373.

In 1905, as shown by the chart, the value of the gas consumed in Pennsylvania for the first time exceeded that produced in the State, and since that time this difference has gradually increased until in 1913 the gas consumed had a value of about 33 per cent. in excess of the production, the total value of the gas consumed being almost $29,000,000.

CONSUMPTION OF NATURAL GAS IN PENNSYLVANIA. 1897-1913.

Year.	Number of Consumers.		Domestic.			Industrial.			Total Consumption.		
	Domestic.	Industrial.	Quantity (M cubic feet).	Cents per M cubic feet.	Value.	Quantity (M cubic feet).	Cents per M cubic feet.	Value.	Quantity (M cubic feet).	Cents per M cubic feet.	Value.
1897,	*201,059	1,124	....	....	....	....	....	....	....	....	$5,392,661
1898,	*218,410	1,021	....	....	....	....	....	....	....	....	6,064,477
1899,	*232,060	1,236	....	....	....	....	....	....	....	....	7,926,970
1900,	*229,730	1,296	....	....	....	....	....	....	....	....	9,812,615
1901,	*326,912	1,743	....	....	....	....	....	....	....	....	11,785,996
1902,	185,678	2,448	....	....	....	....	....	....	....	....	13,942,783
1903,	214,432	2,834	....	....	....	....	....	....	....	....	16,060,196
1904,	238,481	2,929	....	....	....	....	....	....	....	....	17,205,804
1905,	257,416	2,845	....	....	....	....	....	....	....	....	19,237,218
1906,	273,184	3,807	41,135,808	22.2	9,128,837	120,959,365	9.9	11,956,240	162,095,173	13.0	21,985,077
1907,	295,115	3,812	44,840,748	24.2	10,846,922	119,700,431	10.1	12,070,625	164,541,179	13.9	22,917,547
1908,	307,585	4,577	42,202,868	24.0	10,141,517	105,587,299	10.0	10,536,644	147,790,097	13.99	20,678,161
1909,	294,781	5,387	39,729,064	24.4	9,691,804	123,927,081	9.6	11,947,298	163,656,145	13.22	21,639,102
1910,	321,430	4,102	43,404,565	25.3	10,972,250	125,470,994	10.3	12,962,441	168,875,559	14.17	23,934,691
1911,	330,537	4,597	41,026,643	26.02	10,676,168	113,448,733	11.26	12,769,833	154,475,376	15.18	23,446,001
1912,	345,765	3,442	49,331,092	24.64	12,153,254	124,324,911	11.53	14,333,048	173,656,003	15.25	26,486,302
1913,	400,823	4,373	46,699,256	26.82	12,524,478	130,763,974	12.38	16,185,087	177,463,230	16.18	28,709,565

*Number of fires.

PRINCIPAL OIL AND GAS POOLS IN SOUTHWESTERN PENNSYLVANIA.

Number on Map.	Name.	Location by Quadrangles.
1,	Broad Tree,	Cameron. Littleton.
2,	New Freeport,	Mannington. Rogersville
3,	Aleppo,	Rogersville
4,	Lantz,	Rogersville.
5,	Bristoria,	Rogersville.
6,	Richhill,	Rogersville.
7,	Grays Fork,	Rogersville.
8,	Nineveh,	Rogersville.
9,	Waynesburg,	Waynesburg.
10,	Mt. Morris,	Waynesburg.
11,	Garrison,	Waynesburg.
12,	Whiteley Creek,	Masontown.
13,	Blackshire,	Masontown.
14,	New Geneva,	Masontown.
15,	Masontown,	Masontown.
16,	Fayette,	Masontown.
17,	Hadenville,	Masontown.
18,	Zollarsville,	Amity.
19,	Centerville,	Brownsville.
20,	Bellevernon,	Brownsville.
21,	Forward,	Brownsville.
22,	Ross and Somerset,	Amity.
23,	Amity,	Amity.
24,	Fonner,	Amity.
25,	Dague,	Claysville.
26,	Point Lookout,	Claysville.
27,	Washington-Taylorstown,	Claysville. Amity.
28,	Lagonda,	Claysville.
29,	Mehaffey,	Claysville.
30,	Buffalo,	Claysville.
31,	Lindon,	Amity.
32,	McMurray,	Carnegie.
33,	Bridgeville,	Carnegie.
34,	Clifton (Sodom),	Carnegie.
35,	Woodville (Heidelburg),	Carnegie.
36,	Cannonsburg,	Carnegie.
37,	Hickory,	Burgettstown.
38,	McDonald,	Carnegie.
39,	Candor,	Burgettstown.
40,	Burgettstown,	Burgettstown.
41,	Eldersville,	Burgettstown.
42,	Florence,	Burgettstown.
43,	Five Points,	Burgettstown.
44,	Murdocksville,	Burgettstown.
45,	Imperial,	Carnegie. Burgettstown.
46,	McCurdy,	Carnegie.
47,	Moon Run,	Carnegie.
48,	Crafton,	Carnegie.
49,	Neville Island,	Carnegie. Sewickley.
50,	McCormick,	Carnegie.
51,	Moon,	Carnegie. Burgettstown. Sewickley.
52,	Coraopolis,	Sewickley.
53,	Leetsdale,	Sewickley.
54,	Legionville-Economy,	Sewickley.
55,	Shannopin,	Beaver. Sewickley.
56,	New Sheffield,	Beaver. Sewickley.

PRINCIPAL OIL AND GAS POOLS IN SOUTHWESTERN PENNSYLVANIA —Continued.

Number on Map.	Name.	Location by Quadrangles.
57,	Hookstown,	Beaver.
58,	Smiths Ferry,	Beaver.
59,	Davis,	Sewickley.
60,	Grubbs,	Sewickley.
61,	Mt. Nebo,	Sewickley.
62,	Glenfield,	Sewickley.
63,	Dixmont,	Sewickley.
64,	Perrysville,	Sewickley.
65,	Sandle,	Sewickley.
66,	Wildwood,	Sewickley.
67,	Bellevue,	Sewickley.
68,	Keown,	Sewickley.
69,	Carnot-Leetsdale,	Sewickley.
70,	Ingomar,	Sewickley.
71,	Wexford,	Sewickley.
72,	Duff City,	Sewickley.
73,	Brush Creek,	Sewickley.
74,	Craig,	Sewickley.
75,	Cookson,	Sewickley.
76,	Crows Run,	Sewickley.
77,	Lovi,	Sewickley.
78,	Criders,	Sewickley.
79,	Peters,	Sewickley.
80,	Mars,	Sewickley.
81,	Callery,	Sewickley.
82,	Evans City,	Sewickley.
83,	Ramsey,	Sewickley.
84,	Garvin,	Sewickley.
85,	Creekside,	Indiana.
86,	Willetts,	Indiana. Elders Ridge.
87,	Plum Run,	Elders Ridge.
88,	Girty,	Elders Ridge.
89,	Roaring Run,	Elders Ridge.
90,	Shellhammer,	Elders Ridge.
91,	Rockville,	Elders Ridge.
92,	Say,	Elders Ridge.
93,	Bradys Bend,	Kittanning.
94,	Karns City,	Kittanning.
95,	Winfield,	Kittanning.
96,	Glade Run,	Kittanning.
97,	Limestone Run, (Limestone),	Kittanning.
98,	Madison,	Rural Valley.
99,	Cowanshannock,	Rural Valley.
100,	Ford City,	Kittanning.
101,	Garrett Run,	Rural Valley.
102,	Atwood,	Rural Valley.
103,	Mahoning Furnace,	Rural Valley.
104,	....	....
105,	Slate Lick,	Kittanning.
106,	Elk City,	Clarion.
107,	Clarion,	Clarion.
108,	Miola,	Clarion.
109,	Manor,	Clarion.
110,	Bittenbender,	Clarion
111,	Blair,	Clarion.
112,	Piolett,	Clarion.
113,	Frogtown-Greenville,	Clarion.
114,	Piney Grove,	Clarion.
115,	George,	Clarion.
116,	Keifer,	Clarion.
117,	Sligo,	Clarion.
118,	Latrobe,	Latrobe.
119,	Grapeville,	Latrobe. Greensburg.

PRINCIPAL OIL AND GAS POOLS IN SOUTHWESTERN PENNSYLVANIA —Continued.

Number on Map.	Name.	Location by Quadrangles.
120,	Murrysville,	Greensburg.
121,	Homewood,	Pittsburgh.
122,	Jefferson,	Pittsburgh.
123,	Thorn Creek,	Butler. Zelienople.
124,	Glade,	Zelienople.
125,	Bakerstown,	New Kensington.
126,	Lardinton,	New Kensington.
127,	Saxonburg,	Butler. New Kensington.
128,	Slipperyrock,	Zelienople.
129,	Bessemer,	New Castle. Neshannock. Columbiana.
130,	Harrisville,	Hilliards. Mercer.
131,	Centerville,	Mercer.
132,	Bullion,	Hilliards.
133,	Clintonville,	Hilliards.
134,	Emlenton,	Hilliards. Foxburg.
135,	Freeport,	Freeport.
136,	Kittanning,	Freeport.
137,	Leechburg,	Freeport.
138,	Apollo,	Freeport.
139,	Pine Run,	New Kensington.
140,	Tarentum,	New Kensington.
141,	Monaca,	Beaver.
142,	Bellowsville,	Beaver.
143,	Carson,	Beaver. Wellsville.
144,	Kendall,	Beaver.
145,	Bradys Run,	Beaver.
146,	New Galilee,	New Castle.

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